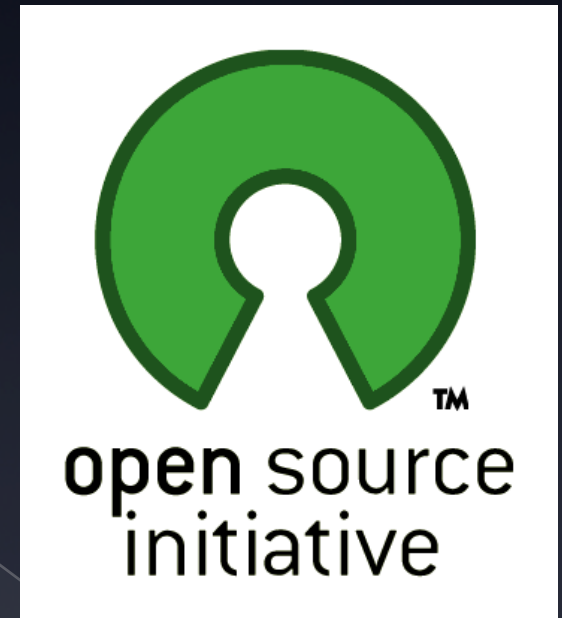


缓动

口碑F2E 正邪 2010.08.22

EASING EQUATIONS

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<http://www.robertpenner.com/easing.html>

什么是运动

- ◎ 时间
- ◎ 位置

位置是时间的函数，在任意指定的时间，运动都有确定的数值。



匀速运动

- ◎ 机械
- ◎ 僵硬
- ◎ 看起来太假了

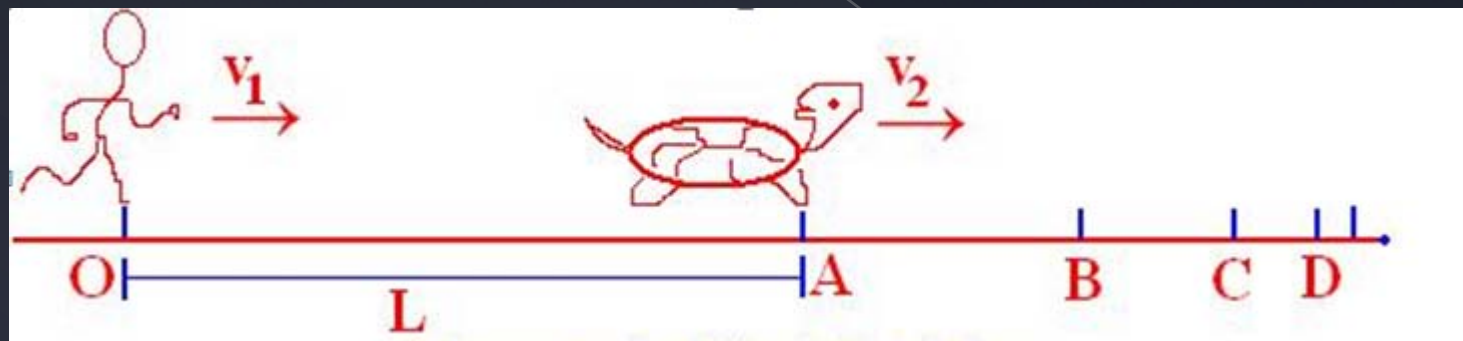


缓动

- ◎ 缓入 (ease-in)
- ◎ 缓出 (ease-out)
- ◎ 缓入缓出 (ease-in-out)

标准指数滑动

- ◎ 庄子：一尺之棰，日取其半，万世不竭
- ◎ 芝诺悖论(Zeno 's paradoxes)：阿喀琉斯跑不过乌龟



变形的关键因素

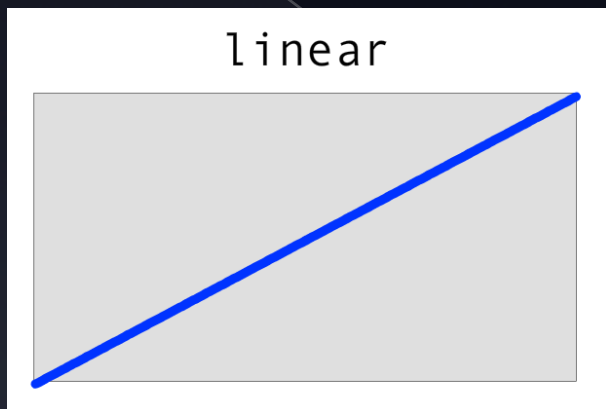
- ◎ 起始位置
- ◎ 改变量
- ◎ 所需时间

变形函数

```
getTweenPosition=function(time, begin, change, duration){  
    return position;  
}
```

```
getTweenPosition=function(t, b, c, d){  
    return position;  
}
```

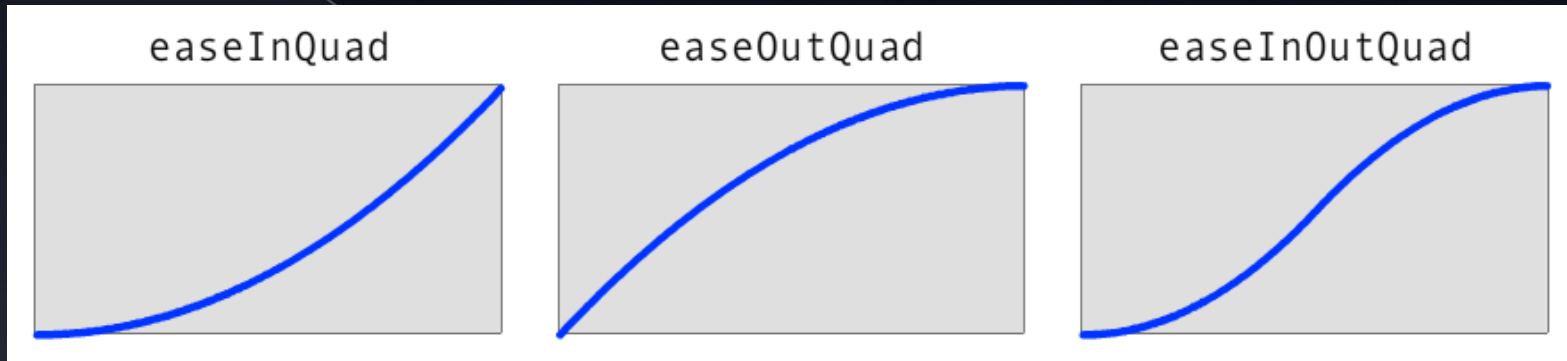

线性变形



$$p(t) = t$$

```
Y.Anim.DEFAULT_EASING = Y.Easing.easeNone =  
function (t, b, c, d) {  
    return c * t / d + b; // linear easing  
};
```

二次缓动



$$p(t) = t^2$$

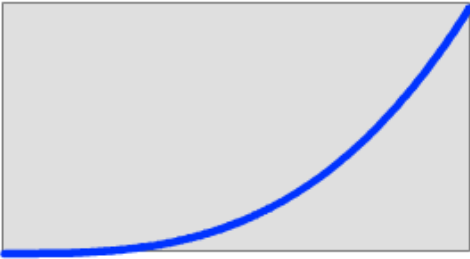
Y.Easing.easeIn

Y.Easing.easeOut

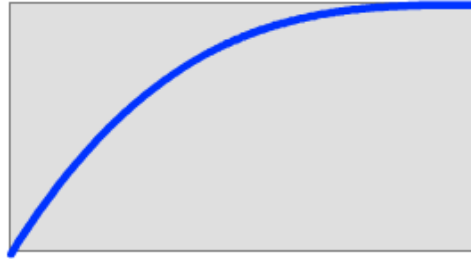
Y.Easing.easeBoth

三次缓动

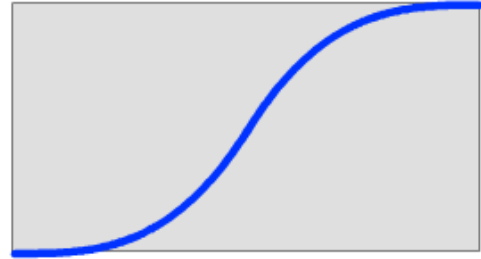
easeInCubic



easeOutCubic

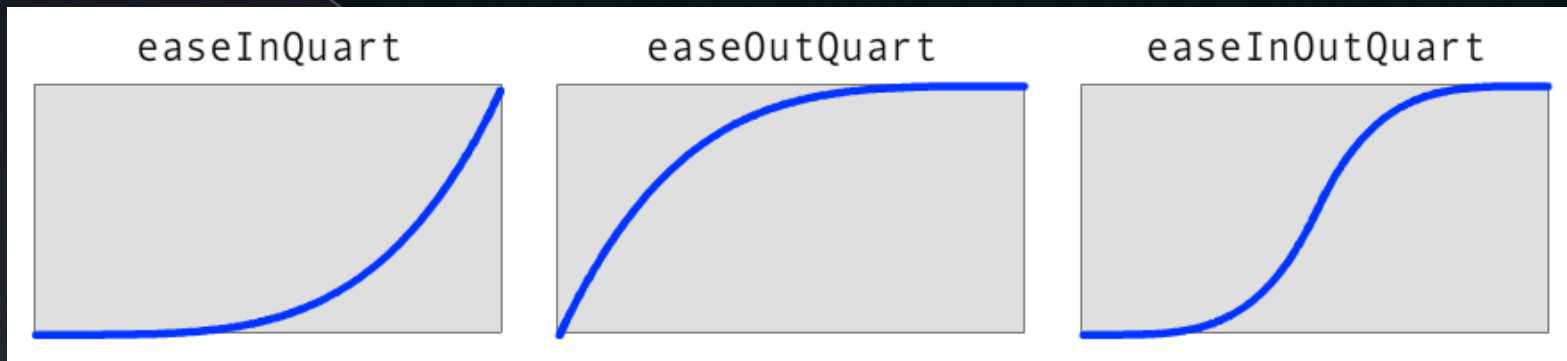


easeInOutCubic



$$p(t) = t^3$$

四次缓动

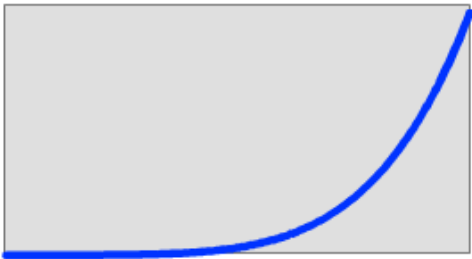


$$p(t) = t^4$$

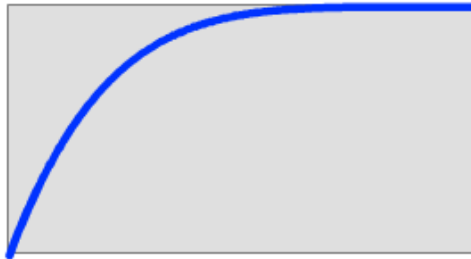
Y.Easing.easeInStrong
Y.Easing.easeOutStrong
Y.Easing.easeBothStrong

五次缓动

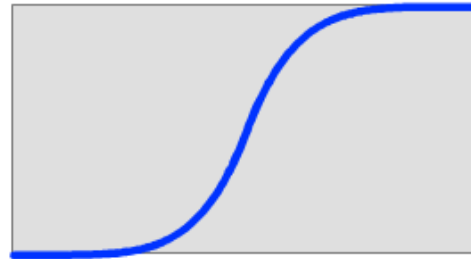
easeInQuint



easeOutQuint

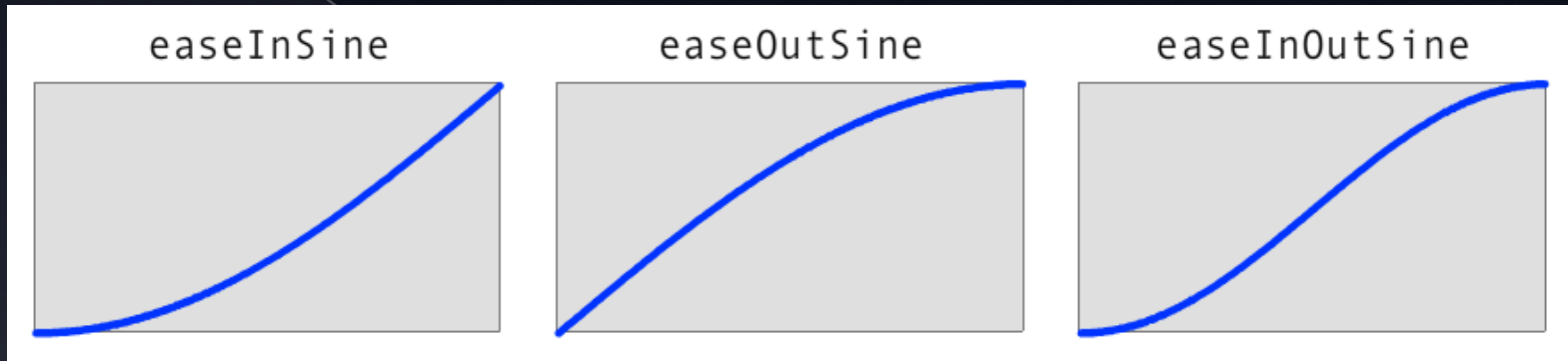


easeInOutQuint



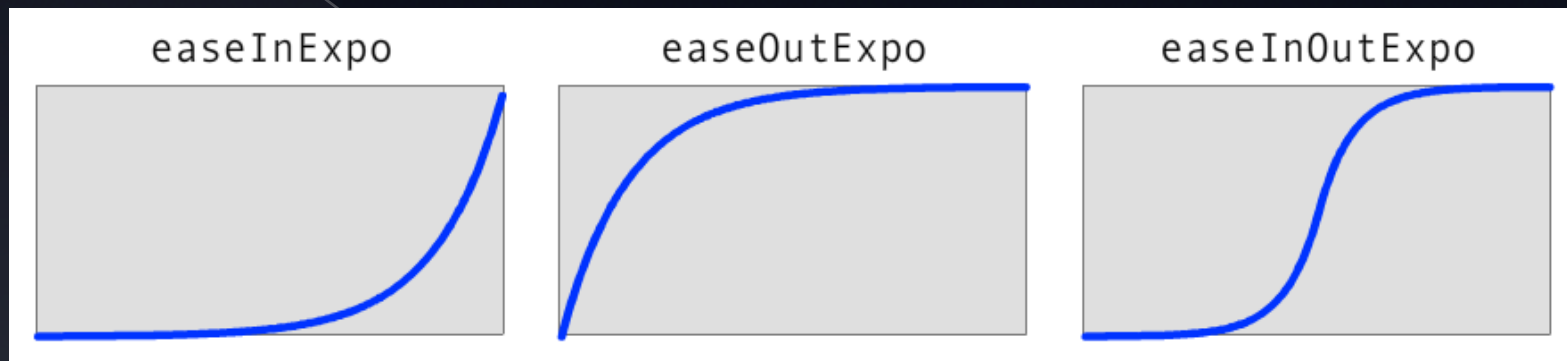
$$p(t) = t^5$$

正弦缓动



$$p(t) = \sin(t \times \pi/2)$$

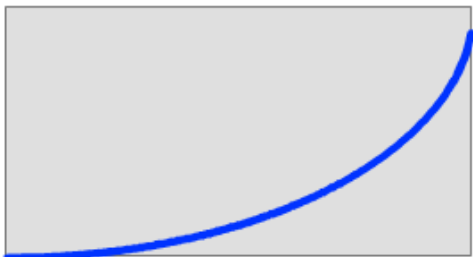
指数缓动



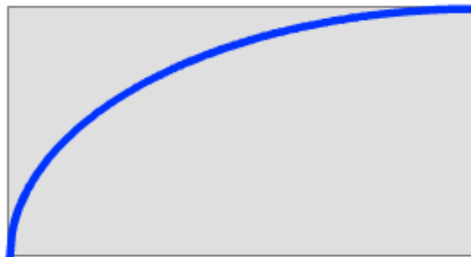
$$p(t) = 2^{10(t-1)}$$

圆形缓动

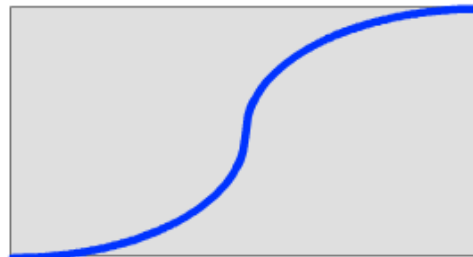
easeInCirc



easeOutCirc

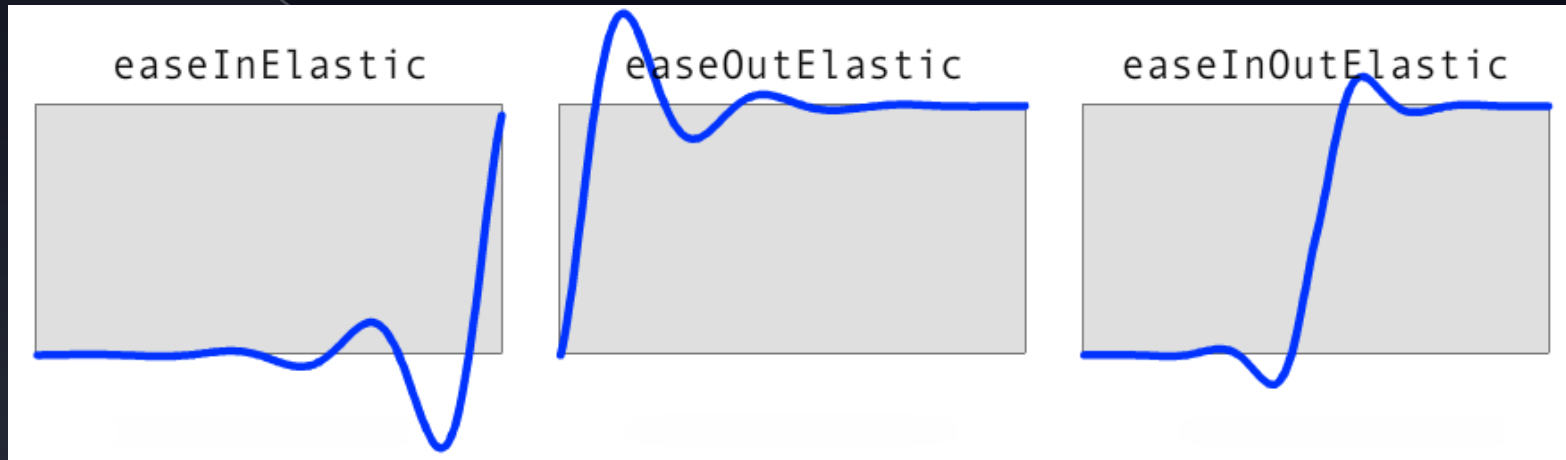


easeInOutCirc



$$p(t) = 1 - \sqrt{1 - t^2}$$

弹性缓动

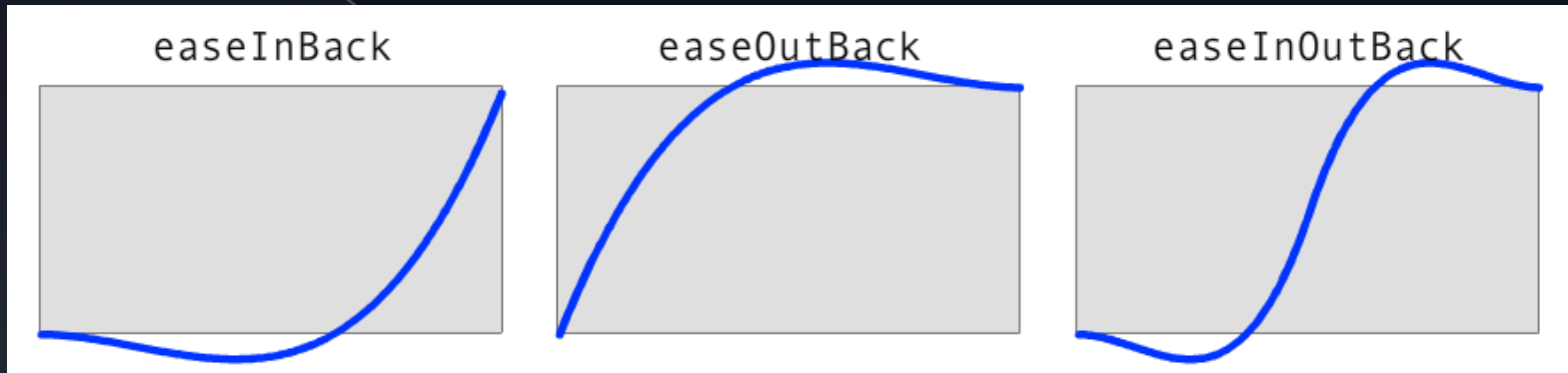


$$p(t) = A \times 2^{10(t-1)} \times \sin((wt - s) \div p \times \pi / 2)$$

Y.Easing.elasticIn
Y.Easing.elasticOut
Y.Easing.elasticBoth

Amplitude & Period

回退缓动

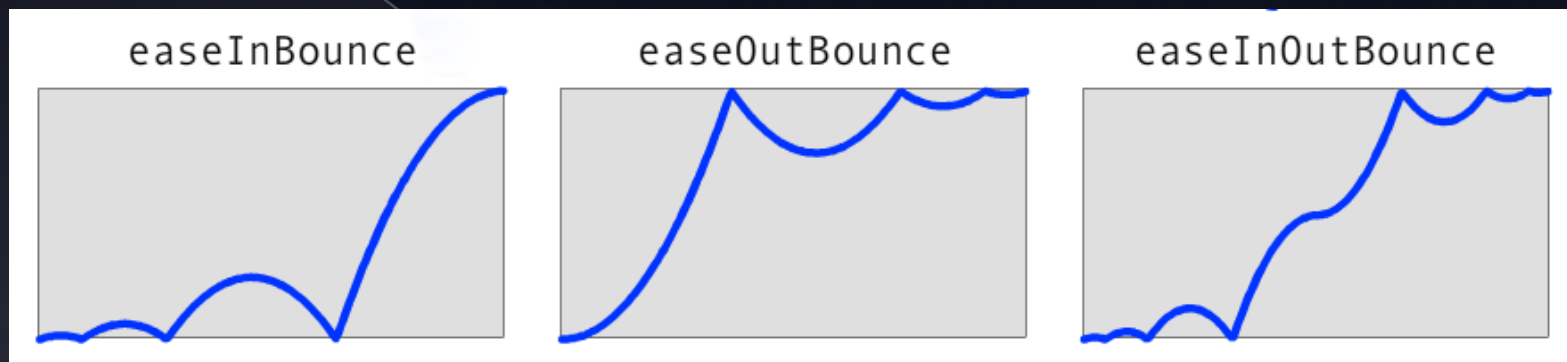


$$p(t) = at^3 + bt^2 + ct^1$$

Y.Easing.backIn
Y.Easing.backOut
Y.Easing.backBoth

Overshoot

弹跳缓动



$$p(t) = t^2$$

Y.Easing.bounceIn
Y.Easing.bounceOut
Y.Easing.bounceBoth

Thank

